



Renewable energy

ComAct educational materials



Using renewable energy in multi-family apartment buildings

What is renewable energy?

Renewable energy, often referred to as clean energy, is energy that comes from natural sources or processes that are constantly replenished. For example, sunlight and wind keep shining and blowing, even if their availability depends on time and weather.

What energy sources are renewable?



Wind power



Solar power



Hydropower



Tidal power



Geothermal energy



Ambient heat captured by heat pumps



Biofuels and the renewable part of waste

Ways to install renewable energy in the home

The use of renewable energies to cover the reduced energy demand after improving the building envelope and upgrading the technical infrastructure is an important step to reduce the dependency of buildings on conventional fossil fuels.

In buildings, renewable energy sources include:



Sustainable biomass and **environmental heat**



Solar thermal and **photovoltaic (PV) energy**

Combined heat and power plants have become smaller, which makes them more attractive for smaller households and multi-family apartment buildings. District heating also offers attractive opportunities for using renewable energies. However, the performance and efficiency of such systems have to be tested. For example, using one large boiler house for an entire district is very efficient, considering the frequent maintenance, but district heating has limitations in reaching more rural areas with greater distances between houses.



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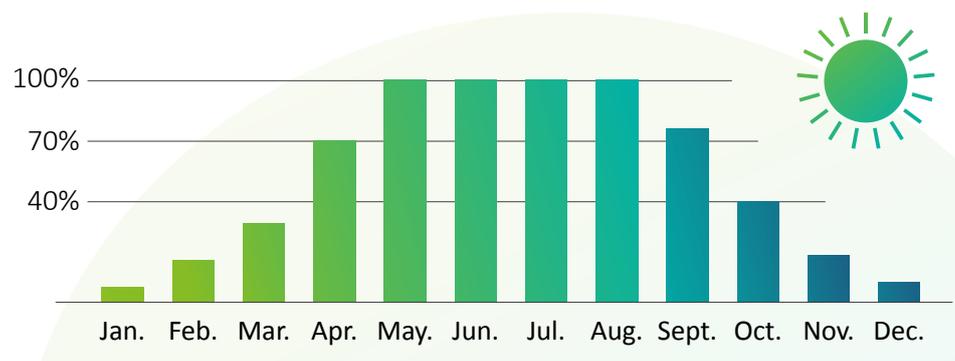
Solar energy

Solar energy is the most prominent technology for energy self-consumption, in particular solar PV, though solar thermal is also widespread. Solar PV generates electricity directly from the sun using solar panels that are integrated into building structures, on the roof, walls or even windows (using transparent panels).

Solar PV can be used directly, be fed into electricity networks or stored on-site. Today solar energy is also financially competitive as its average payback period is only seven years.

Solar thermal is used for hot water as well as heating and cooling. The panels on the roof function as collectors of sunlight, containing tubes with liquid in them. Solar radiation heats up the liquid in the tubes which is then transported into the heating system ready for use, e.g. for heating water.

Possible monthly share of hot water demand covered by solar thermal



Recommended size of thermal collectors:

- For heating support in residential buildings: 0.5- 0.8 m² collector area per 10 m² heated living area
- For hot water production in residential buildings: approx. 1.5 m² per person



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Heating with solar energy

There are two main types of solar thermal collectors: flat-plate collectors and vacuum collectors. They must be positioned in such a way as to capture as much solar energy as possible. Insulation is used to reduce heat loss. A circulating fluid, such as plain water, transports heat to be stored and used later on.

The operating temperature can be up to 125oC. Solar collectors are normally placed on the roofs of buildings.

Heat pump technology

A heat pump uses solar heat from the environment: the atmosphere, the surface water or the subsoil and groundwater. The energy is extracted through a system of heat exchangers and then concentrated in the heat pump cycle.

In this process the temperature of the circulating fluid increases up to 30-50/60°C. A certain amount of energy is required to power the heat pump, so the heat conversion factor – the ratio of heat produced to electrical energy consumed – is important. Efficient heat pumps operate with a conversion factor of 1kWh to 3-4 kWh. If required, the heat pump can operate in reverse mode, i.e. to cool the room.

The use of heat pumps is gaining in popularity in new and existing buildings.



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Wind energy

Wind turbines are one of the most prominent renewable energy solutions. For private buildings the use of small on-site wind turbines can be an affordable tool. However performance is often inconsistent if they are not installed properly or the wind conditions have not been measured right.

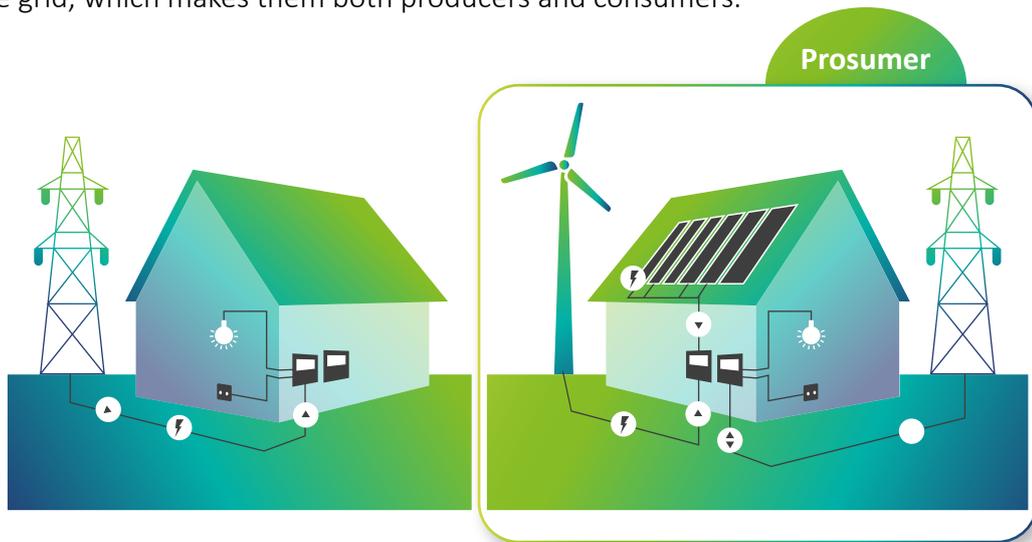
Biomass

Biomass is plant or animal material used as fuel to produce electricity or heat. Examples are wood, energy crops and waste from forests, yards or farms. The use of biomass fuels for transportation and for electricity generation is increasing in many developed countries to replace fossil fuel use. Biomass can be burned directly for heat or converted to renewable liquid and gaseous fuels through various processes. Even though biomass is categorised as renewable, the side effects for health though increased air pollution and impacts on forests and land use can outweigh its benefits. This has to be assessed on a case-by-case basis.



Becoming a prosumer

'Prosumers' both produce and consume electricity. They 'self-consume' some of the electricity they produce and sell the excess to the grid. But when their production falls short, they also buy power from the grid, which makes them both producers and consumers.



New “plug and play” technology makes being a prosumer easy. Small modules that easily fit on a balcony feed produced electricity into the network via the nearest power socket. The solar panel has an integrated inverter which is used to meet the household’s own “baseload”. For instance, a single solar panel with an output of 300 W can regularly produce 2 kWh for several hours a day, enough to meet the demands of all household devices on standby and possibly even the refrigerator when it kicks in. Such PV modules do not usually need additional approval by local authorities.



Cost savings potential

Renewables have great potential to cut electricity bills, reduce energy poverty and even contribute to reducing income inequality. One way this can happen is by making sure that everyone, regardless of whether they own or can access a roof, can participate in the electricity market.

Investing in solar modules on the roofs of apartment buildings can be a worthwhile addition to standard renovations and a way of lowering costs, not only for electricity but also for heat when using heat pumps or solar thermal.



A very efficient way of modernising a building’s heating and energy system is to employ a combined heat pump linked to a PV system and integrate this into a renovation of the building. This could save up to 60% of the annual costs for heating and hot water, as compared to a conventional renovation practice.



Another cost-effective measure is to use electricity-based systems for hot water supply during the summer, when centralised heat production for domestic hot water is expensive and impractical.



Legal and financial instruments for using renewable energy in multi-family apartment buildings in the EU

The European Union has set out an enabling framework for self-consumption and is supporting its roll-out Europe-wide. The Renewable Energy Directive gives people living in apartments the right to jointly set up renewable energy projects.

As well as the legislative support, several financial and knowledge support services are available.



Legislative support



Several financial support



Knowledge support services

The European Structural and Investment Funds (ESIFs) for regional and infrastructure development can provide support to regions looking to make the energy transition by providing funding for projects that contribute to European goals. Of the five ESIFs, the European Regional Development Fund is the main source of funding for small-scale renewables projects, with regions able to use funds to establish financial instruments and policy schemes that can support individual households. Solar power plant prices are still high enough to discourage lower-income consumers, which is why state support is an indispensable tool for further developing solar energy.



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